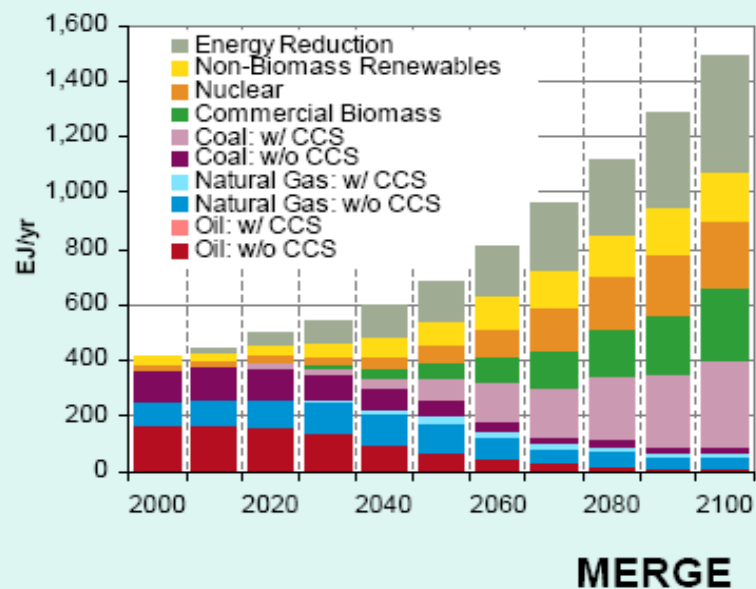
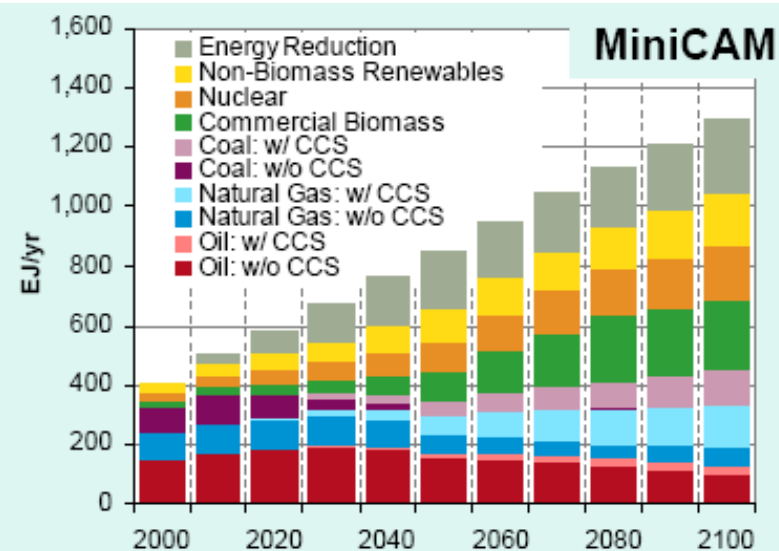
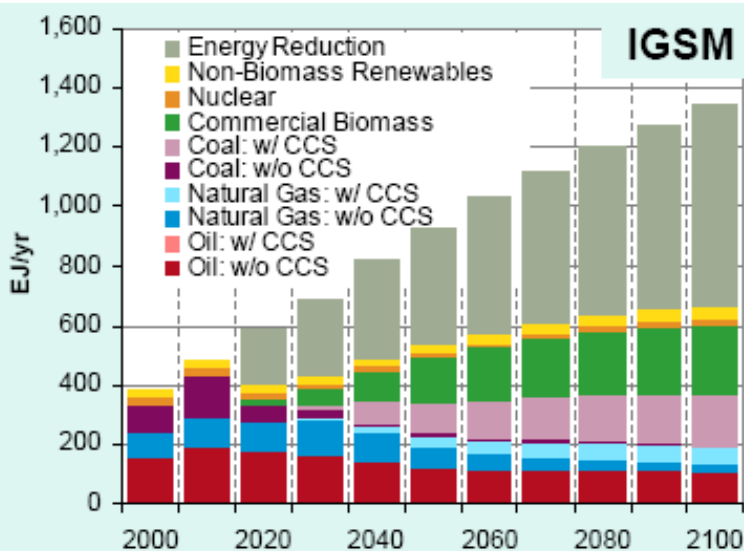




A Perspective on Smart Grid Development

Model forecasts of the technology mix that would stabilize level of greenhouse gases in the atmosphere at 450 ppm (IGSM –MIT; MiniCAM – PNNL; and EPRI – MERGE)



All three models show that over time a large and increasing commitment to energy reduction measures will be needed. Along with other key measures, smart grid development and deployment facilitates realization of this objective.

The Smart Grid

- ... involves the use of advanced communications technologies and modern computing capabilities ..(engineering & materials as well).. to upgrade the electric power grid, effectively making it more intelligent, enabling it to operate more reliably and efficiently, and allowing customers enhanced support, opportunities, and direct involvement in controlling power consumption.
- ... is about the transformation, modernization, automation, and digitalization of the electricity supply chain.
- ... is an **evolutionary** innovation that will occur over a decade or more time span to fully mature.
- ... aims for achieving a 21st century intelligent electricity network needed to support and enable a 21st century growing economy in an ever competitive global market
- ... broadband is critical to enabling a continuous sensing, information network which overlays and **connects** together a utility's equipment, devices, systems, customers, partners and employees. It enables 'on-demand' **access to data & information** to better manage, automate & optimize operations and planning processes throughout the utility, the electricity supply chain and the customer's benefit

Broadband is the backbone to the development of the Smart Grid ...

- ▶ According to one estimate, a smart electric grid built on better information and communication could reduce CO₂ emissions by 230-480 million metric tons and save \$15-35 billion in energy and fuel costs.
- ▶ Particularly in regard to smart grid security and reliability, rapid communication in timeframes of a few milliseconds can only be achieved on a broadband network.
- ▶ Broadband can unleash the potential of modern computer/communications technology to support the kinds of applications needed to achieve the benefits of the smartgrid, for example: the increasing use of renewable power supplies, distributed energy applications, plug-in hybrid vehicle technology, demand-response capabilities, wide-area situational awareness, and energy efficiency objectives.
- ▶ Broadband is essential for handling the massive amounts of information that will need to be communicated—for example frequent messages to every home and business or even to individual devices within a customer's premises
- ▶ Recent analysis by the Information Technology & Innovation foundation found that an investment of \$30 billion in America's digital infrastructure would create or retain 949,000 U.S. jobs and spur creation of an addition 500,000 small business jobs.

‘Do nothing’ is not an option **but...**

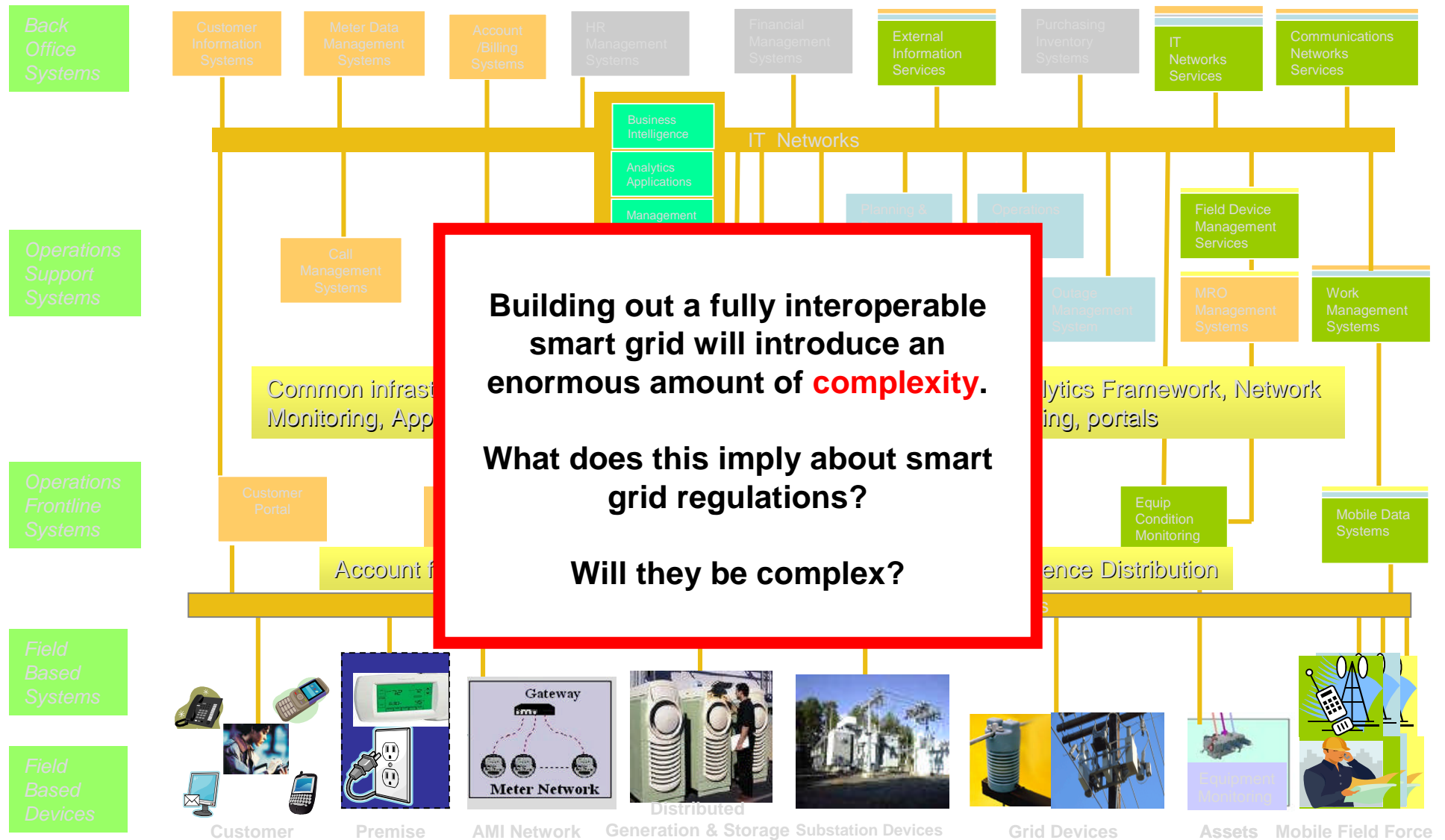
**... we are going where we have
never been before.**

Challenge for policymakers

Facilitate and stimulate industry engagement in the development of a safe, reliable, end-to-end smart grid energy efficiency framework.

Federal funding provided for development and implementation of Smart Grid technologies will greatly enhance efforts to bring the smart grid to reality.

THINGS TO THINK ABOUT:



EPRI report to NIST on the Smart Grid Interoperability Standards Roadmap:

- ▶ **Policy makers and regulators should carefully consider what regulations are critical to Smart Grid evolution.**
- ▶ **Minor differences in regulation may require major investment in technology to satisfy regulatory requirements.**

Confidential business information

- ▶ **Along with the development and evolution of the smart grid will come a greatly increased need for data access and data sharing.**
- ▶ **Regulations conceivably can facilitate these needs, but should at the same time accommodate the needs of business and industry to protect confidential business information and assure a competitive marketplace.**

Intergovernmental coordination ...

- ▶ **Various government agencies (FERC, DOE, FCC, NIST, DHS, DOT, etc.) are engaged in aspects of smart grid policy and regulatory development.**
- ▶ **All agencies having such responsibilities should meet and work together to minimize the potential for regulatory overlap, confusion, redundancies, contradictions, and inefficiencies as well as assure a coordinated understanding of regulatory needs. While some of this is happening it is not clear if on-going interactions are adequate.**
- ▶ **Provision of a readily available and transparent routine accounts of such coordination meetings to business and industry and other stakeholders could aid investment decisions as well as business planning, mitigate uncertainties, and ensure a more full engagement of stakeholders in the smart grid development planning process.**

Promoting “Big Picture” Transparency ...

- ▶ Except in respect to national security concerns, a publicly accessible, **UNIVERSAL ROADMAP** that **transparently** ties together all the government agencies' smart grid activities should be established and maintained on an ongoing basis. NIST is building a smart grid interoperability standards roadmap, but where is there a government interactions roadmap?
- ▶ An **I**ntergovernmental **S**mart **G**rid **C**oordinating **C**ommittee (**ISGCC**) should be formed whose responsibility is to establish and maintain a routinely updated internet portal through which, in a transparent manner, business and industry as well as other stakeholders can access the evolving roadmap, understand how all the disparate governmental agency smart grid activities are tied together, and assess what progress is being realized.
- ▶ Just as the smart grid enables two way communication, the intergovernmental portal should also enable two way communication on an on-going basis through which business and industry and other stakeholders can provide feedback about the roadmap. The ISGCC should meet periodically to evaluate and take account of such feedback.

Avoid regulatory gridlock ...

- ▶ Just as the smart grid will evolve over time, so must regulatory policy evolve.
- ▶ However, once regulations are established they often have a tendency to become “locked in stone.”
- ▶ This could be a problem, because as the smart grid evolves, entrenched regulations may not “keep up with” evolving policy needs for advancing smart grid development. As a result, over time, it is possible that as the smart grid evolves, existing regulations could become increasingly out of synch with smart grid development needs. Should this happen it could introduce growing regulatory inefficiencies that work against smart grid development progress and competitiveness objectives.
- ▶ The **ISGCC** should therefore agree and implement a process by which smart grid regulations can be periodically reviewed for their utility and effectiveness, and where inefficiencies are observed, such regulations should either be revised, removed, or replaced.

Cybersecurity

Previous investigations have found that...

- ▶ The dominant issue in security is people.
- ▶ Economics, psychology, and sociology trump technology.
- ▶ We are incapable of building fully secure systems (and could not live with them if we could).

Some things to evaluate...

- ▶ There is a need to consider what further attention is warranted to assure grid reliability in the event of *successful* malicious intrusion(s).
- ▶ Analogous to simulated attacks on nuclear facilities, attacks on the smart grid should be periodically run or simulated, and contingency measures and countermeasures should be revised as needed.
- ▶ How well do we understand to what extent intrusions will in fact result in dire consequences?
- ▶ Are we adequately prepared to deal with dire consequences?

**"Well, officer, the coffee pot at home tried
to tell my PDA to buy some Colombian beans on
the way home, but the car overheard the message
and took it as a command to turn for the
grocery store right away..."**



Closing thoughts ...

- Address the policy and regulatory reforms needed to properly encourage the new investment needed:
 - As economic regulators, state commissioners ask questions about the potential costs and benefits of the smart grid to the rate payers in a given service territory.
 - Rate reform of some sort is almost certainly needed, such as time of use and/or perhaps decoupling.
 - Cost recovery is a significant concern. How to balance the speed of technological change with rate base and long depreciation schedules is a concern.
 - Incorporation of renewable generation sources may raise questions of state vs. federal jurisdiction, as in who will pay for new transmission lines and how.